

Appn. No. 10/654,174  
Amdt. Dated January 27, 2006  
Reply to Office Action of July 28, 2005

**Amendments to the Drawings:**

The Examiner objected to the drawing.

Applicants have provided herewith a Replacement Figure.

The attached sheet includes changes to the drawing.

The changes made to the original drawing are as follows:

The caption "Figure 1" was added as requested by the Examiner. The hand-written notations "Comparative" and "Example of Invention" and "boxes" were replaced with printed notations. The headings "**Module Corroded Area vs. TCO Hardness**" (and its double underlining) and "**Corroded Area of Modules vs. Number of Taber Traverses**" were deleted. The printed notation "**After 125 hours at 85°C, 85% RH and 70 V forward bias, the corroded area of TF1 modules decreased rapidly with increasing hardness of the tin oxide as measured by the Taber Abraser Test.**" was deleted.

Attachment: Replacement Figure

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### REMARKS

Claims 1-6, 8, and 13-18 are amended by deleting "when using" and substituting therefor --on a--. Applicants are making this amendment to overcome the Examiner's rejection that "when using" is unclear.

Claims 1, 8 and 13 are amended to recite that the photovoltaic device has an improved resistance to corrosion. Support for this amendment is in the specification at, for example, page 5, lines 19 and 20. Figure 1 also shows such improved resistance to corrosion. Applicants are making this amendment to more clearly point out the benefit of the invention.

Applicants amended Claim 13 to more clearly recite how the photovoltaic device is made. Support for the amendment is in the specification at, for example, page 2, lines 29 and 30.

Applicants amended the specification as described on page 2 of this paper. These amendments do not add new matter. The added text is taken from Figure 1 as originally filed.

#### Rejection Under 35 U.S.C. § 112, second paragraph

The Examiner rejected Claims 13-20 under 35 U.S.C. § 112, second paragraph. Applicants respectfully submit that Applicants' amendment to the Claims have overcome this rejection.

#### Rejection Under 35 U.S.C. § 102/103

The Examiner rejected Claims 8, 9, and 13-20 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Lampkin et al. U.S. Patent 4,307,681 ("Lampkin").

The Examiner stated that with respect to Claims 8 and 13, Lampkin teaches the preparation of a thin film solar cell comprising a glass substrate, a hard, highly scratch resistant tin oxide conductive transparent layer on the substrate wherein said tin oxide layer reads on the instant CTO. The Examiner stated that it was the Examiner's position that Lampkin's tin oxide films prepared at column 12, line 11, through column 13, line 44 inherently have the instant hardness of at least about 200 Number of Taber passes.

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Applicants respectfully submit that Lampkin does not anticipate Claims 8, 9 and 13-20. Specifically, Lampkin does not teach a CTO layer that has a hardness of at least about 200 Number of Taber Abraser passes measured using a CTO layer that is 6000 angstroms thick. It is the Examiner's position that since Lampkin teaches a hard tin oxide layer, Lampkin inherently discloses Applicants' invention. However, Applicants respectfully wish to point out that it is well settled patent law that in order for a reference to inherently disclose a limitation of a claimed invention, the inherency must be certain. Inherency must be a necessary result and not merely a possible result. Applicants respectfully submit that Lampkin does not meet this requirement. While it is true that Lampkin, as pointed out by the Examiner, states at column 13, lines 60-64, "hard film is produced which is highly scratch resistant, a desirable characteristic to withstand handling and to permit overlying materials to be removed without removing the  $\text{SnO}_x$ ", there is nothing in Lampkin that states how hard the film is. On the other hand, Applicants discovered that the use of a CTO film such as tin oxide that has a hardness of at least about 200 Number of Taber Abraser passes, results in a photovoltaic device having improved corrosion resistance. Applicants respectfully submit that Lampkin does not teach Applicants' invention to one of skill in the art. Applicants respectfully request the Examiner to refer to the Figure in the instant patent application which shows that a tin oxide CTO layer having a hardness of 100 Number of Taber Abraser passes had a corrosion of about 50 to 60 square centimeters. However, once the hardness is increased to about 200 or more Number of Taber Abraser passes in accordance with Applicants' invention, as shown by an interpolation of the data in Figure 1, the corrosion resistance of the photovoltaic module made with such CTO layer improves so that there is only about 15 square centimeters of corrosion, and when the hardness is increased to 430 Number of Taber Abraser passes, the corrosion reduces to about 1 square centimeter. Thus, Applicants discovered that the hardness of the CTO layer, a hardness of at least about 200 Number of Taber Abraser passes, greatly and unexpectedly improves the corrosion

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resistance of a photovoltaic device such as a module. Applicants respectfully submit that simply because Lampkin states that the tin oxide layer disclosed therein is "hard" or "highly scratch resistant" does not inherently disclose Applicants' invention. It does not "necessarily" teach to one of skill in the art to use the CTO layer having the hardness as recited in Applicants' claims. As shown by the data in Applicants' Figure 1, a tin oxide layer having a hardness of 100 Taber Abraser passes has a substantially greater amount of corrosion compared to the photovoltaic devices made with the hard tin oxide CTO as instantly claimed.

Applicants also respectfully submit that Applicants' invention is not obvious in view of Lampkin. As stated above, Lampkin does not teach or suggest a photovoltaic device, module or method of making a photovoltaic device having a CTO layer having a hardness of at least about 200 Number of Taber passes measured on a CTO layer that is 6000 angstroms thick. As discussed above, Lampkin only states that the tin oxide layer described therein is hard and highly scratch resistant. It provides no indication of how hard the tin oxide layer is. Furthermore, Lampkin does not disclose or suggest that a CTO layer having a hardness as recited in Applicants' Claims of at least about 200 Number of Taber Abraser passes provides for improved resistance to corrosion.

Applicants respectfully submit therefore that instant claims 8, 9 and 13 through 20 are patentable over the Lampkin patent.

The Examiner rejected Claims 1-20 under 35 U.S.C. § 102(b) as anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over JP 11-298018 (JP '018).

The Examiner stated that the tin oxide film disclosed in JP '018 strengthens the substrate and that it is the Examiner's position that the tin oxide films of JP '018 inherently have the hardness of at least about 200 Number of Taber passes.

Applicants respectfully submit that JP '018 does not anticipate Applicants' invention. For the reasons stated above, in order for a reference to inherently

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disclose a limitation of a claimed invention, the inherency must be certain. Inherency must be a necessary result and not merely a possible result. Applicants respectfully submit that the translation provided by the Examiner for JP '018 does not, for example, teach a CTO layer such as a tin oxide layer having a hardness of at least about 200 Number of Taber Abraser passes either explicitly or inherently. The JP '018 document relied on by the Examiner appears to address strength of a solar battery. However, Applicants respectfully submit that JP '018 does not disclose anything about the hardness of the tin oxide layer and therefore does not anticipate or make obvious Applicants' invention.

The Examiner rejected Claims 1-7 and 10-12 under 35 U.S.C. § 103(a) as being unpatentable over Lampkin in view of JP 9-116180 (JP '180).

The Examiner stated that Lampkin teaches the preparation of a solar cell comprising a glass substrate, a hard, highly scratch resistant tin oxide conductive transparent layer on the substrate, a heterojunction photovoltaic element on the tin oxide layer, and a conductive layer on the photovoltaic element. The Examiner stated that Lampkin's tin oxide films inherently have the instant hardness of at least about 200 Number of Taber Abraser passes. The Examiner stated that Lampkin does not teach the use of a second substrate. The Examiner stated that JP '180 teaches a rear covering comprising a thermosetting resin. The Examiner concluded that it would have been obvious to one of ordinary skill in the art to have provided Lampkin's solar cell device with a second substrate.

Applicants respectfully submit that Applicants' invention is not obvious over Lampkin in view of JP '180. As discussed above, and for the reasons presented above, Lampkin does not, for example, teach or suggest to one of skill in the art photovoltaic devices comprising a CTO layer having a hardness of at least about 200 Number of Taber Abraser passes. Applicants respectfully submit JP '180 does not supply the deficiencies of Lampkin. Furthermore, neither Lampkin nor JP '180 make any reference to photovoltaic devices that

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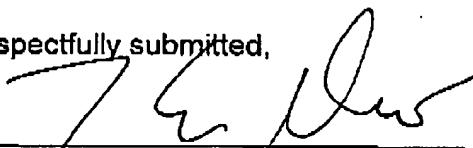
have improved resistance to corrosion. Applicants have provided examples showing the unexpectedly improved corrosion resistance of photovoltaic modules made using the hard tin oxide CTO layer as recited in Applicants' claims. Applicants made the discovery that solar modules made with a hard CTO front contact layer, where the CTO layer has a hardness of at least about 200 Number of Taber Abraser passes measured using a layer 6000 angstroms thick, have improved corrosion resistance. Applicants respectfully submit therefore that Applicants' invention is patentable over Lampkin in view of JP '180.

Applicants respectfully request the Examiner to reconsider the rejections under 35 U.S.C. §§ 102, 103 and 112 and to pass the instant application for allowance.

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Respectfully submitted,

  
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